



# Multi-Media, Multi-Concentration, Organic Analytical Service for Superfund

Office of Emergency and Remedial Response  
Analytical Operations/Data Quality Center (5204G)

Quick Reference Fact Sheet

Under the legislative authority granted to the U.S. Environmental Protection Agency (EPA) under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA), EPA develops standardized analytical methods for the measurement of various pollutants in environmental samples from known or suspected hazardous waste sites. Among the pollutants that are of concern to EPA at such sites are a series of volatile, semivolatile, pesticide, and Aroclor compounds that are analyzed using gas chromatography coupled with mass spectrometry (GC/MS) and gas chromatography with an electron capture detector (GC/EC). The Analytical Operations/Data Quality Center (AOC) of the Office of Emergency and Remedial Response (OERR) offers an analytical service that provides data from the analysis of water, soil/sediment, and waste samples for organic compounds for use in the Superfund decision-making process. Through a series of standardized procedures and strict chain-of-custody, the organic analytical service produces data of known and documented quality. This service is available through the Superfund Contract Laboratory Program (CLP).

## DESCRIPTION OF SERVICES

The organic analytical service provides a technical and contractual framework for laboratories to apply EPA/CLP analytical methods for the isolation, detection and quantitative measurement of 33 volatile, 64 semivolatile, and 28 pesticide/Aroclor target compounds in water and soil/sediment environmental samples. The analytical service provides the methods to be used and the specific technical and contractual requirements, including quality assurance, quality control, and standard operating procedures, by which EPA will evaluate the data. This service uses GC/MS and GC/EC methods to analyze the target compounds. Two data delivery turnarounds are available to the Regional EPA offices: 35 day turnaround and 14 day turnaround after laboratory receipt of the last sample in the set.

## DATA USES

This analytical service provides data which EPA uses for a variety of purposes, such as determining the nature and extent of contamination at a hazardous

waste site, assessing priorities for response based on risks to human health and the environment, determining appropriate cleanup actions, and determining when remedial actions are complete. The data may be used in all stages in the investigation of a hazardous waste site including site inspections, Hazard Ranking System scoring, remedial investigations/feasibility studies, remedial design, treatability studies, and removal actions. In addition, this service provides data that are available for use in Superfund enforcement/litigation activities.

## ANALYTES

The analytes for which this service is applicable and the corresponding baseline quantitation limits are listed in **Table 1**. For water samples, the lowest quantitation limits reportable are 10 ppb for the volatile analytes, 10 ppb for the semivolatile analytes, and 0.05 ppb for the pesticide analytes. For soil samples, the lowest quantitation limits reportable are 10 ppb for the volatile analytes, 330 ppb for the semivolatile analytes, and 1.7 ppb for the pesticide analytes.

Table 1. Target Compound List and Contract Required Quantitation Limits\*

Quantitation Limits		Quantitation Limits	
Water	Low Soil	Water	Low Soil
ug/L	ug/Kg	ug/L	ug/Kg
<b>VOLATILES</b>			
1. Chloromethane	10	63. Acenaphthylene	330
2. Bromomethane	10	64. 2,6-Dinitrotoluene	330
3. Vinyl Chloride	10	65. 3-Nitroaniline	800
4. Chloroethane	10	66. Acenaphthene	330
5. Methylene Chloride	10	67. 2,4-Dinitrophenol	800
6. Acetone	10	68. 4-Nitrophenol	800
7. Carbon Disulfide	10	69. Dibenzofuran	330
8. 1,1-Dichloroethene	10	70. 2,4-Dinitrotoluene	330
9. 1,1-Dichloroethane	10	71. Diethylphthalate	330
10. 1,2-Dichloroethene (total)	10	72. 4-Chlorophenyl phenyl ether	330
11. Chloroform	10	73. Fluorene	330
12. 1,2-Dichloroethane	10	74. 4-Nitroaniline	800
13. 2-Butanone	10	75. 4,6-Dinitro-2-methylphenol	800
14. 1,1,1-Trichloroethane	10	76. N-nitrosodiphenylamine	330
15. Carbon Tetrachloride	10	77. 4-Bromophenyl phenyl ether	330
16. Bromodichloromethane	10	78. Hexachlorobenzene	330
17. 1,2-Dichloropropane	10	79. Pentachlorophenol	800
18. cis-1,3-Dichloropropene	10	80. Phenanthrene	330
19. Trichloroethene	10	81. Anthracene	330
20. Dibromochloromethane	10	82. Carbazole	330
21. 1,1,2-Trichloroethane	10	83. Di-n-butylphthalate	330
22. Benzene	10	84. Fluoranthene	330
23. trans-1,3-Dichloropropene	10	85. Pyrene	330
24. Bromoform	10	86. Butylbenzylphthalate	330
25. 4-Methyl-2-pentanone	10	87. 3,3'-Dichlorobenzidine	330
26. 2-Hexanone	10	88. Benzo(a)anthracene	330
27. Tetrachloroethene	10	89. Chrysene	330
28. Toluene	10	90. bis(2-Ethylhexyl)phthalate	330
29. 1,1,2,2-Tetrachloroethane	10	91. Di-n-octylphthalate	330
30. Chlorobenzene	10	92. Benzo(b)fluoranthene	330
31. Ethylbenzene	10	93. Benzo(k)fluoranthene	330
32. Styrene	10	94. Benzo(a)pyrene	330
33. Xylenes (Total)	10	95. Indeno(1,2,3-cd)pyrene	330
		96. Dibenz(a,h)anthracene	330
		97. Benzo(g,h,i)perylene	330
<b>SEMIVOLATILES</b>			
34. Phenol	330	<b>PESTICIDES/AROCLORS</b>	
35. bis(2-Chloroethyl) ether	330		
36. 2-Chlorophenol	330	98. alpha-BHC	1.7
37. 1,3-Dichlorobenzene	330	99. beta-BHC	1.7
38. 1,4-Dichlorobenzene	330	100. delta-BHC	1.7
39. 1,2-Dichlorobenzene	330	101. gamma-BHC (Lindane)	1.7
40. 2-Methylphenol	330	102. Heptachlor	1.7
41. 2,2'-oxybis(1-Chloropropane)	330	103. Aldrin	1.7
42. 4-Methylphenol	330	104. Heptachlor epoxide	1.7
43. N-Nitroso-di-n-propylamine	330	105. Endosulfan I	1.7
44. Hexachloroethane	330	106. Dieldrin	3.3
45. Nitrobenzene	330	107. 4,4'-DDE	3.3
46. Isophorone	330	108. Endrin	3.3
47. 2-Nitrophenol	330	109. Endosulfan II	3.3
48. 2,4-Dimethylphenol	330	110. 4,4'-DDD	3.3
49. bis(2-Chloroethoxy) methane	330	111. Endosulfan sulfate	3.3
50. 2,4-Dichlorophenol	330	112. 4,4'-DDT	3.3
51. 1,2,4-Trichlorobenzene	330	113. Methoxychlor	17.0
52. Naphthalene	330	114. Endrin ketone	3.3
53. 4-Chloroaniline	330	115. Endrin aldehyde	3.3
54. Hexachlorobutadiene	330	116. alpha-Chlordane	1.7
55. 4-Chloro-3-methylphenol	330	117. gamma-Chlordane	1.7
56. 2-Methylnaphthalene	330	118. Toxaphene	170.0
57. Hexachlorocyclopentadiene	330	119. Aroclor-1016	33.0
58. 2,4,6-Trichlorophenol	330	120. Aroclor-1221	67.0
59. 2,4,5-Trichlorophenol	800	121. Aroclor-1232	33.0
60. 2-Chloronaphthalene	330	122. Aroclor-1242	33.0
61. 2-Nitroaniline	800	123. Aroclor-1248	33.0
62. Dimethylphthalate	330	124. Aroclor-1254	33.0
		125. Aroclor-1260	33.0

\* For volatiles, quantitation limits for medium soils are approximately 120 times the quantitation limits for low soils. For semivolatile medium soils, quantitation limits are approximately 30 times the quantitation limits for low soils.

Specific sample quantitation limits are highly matrix dependent.

The list of target compounds for this service was originally derived from the EPA Priority Pollutant List of 129 compounds. In the years since the inception of the CLP, compounds have been added to and deleted from the Target Compound List, based on advances in analytical methods, evaluation of method performance data, and the needs of the Superfund program.

For drinking water/groundwater type samples, use of the low concentration organic analytical service (water matrix) is recommended. For high hazard organic samples (e.g., drum samples), use of the high concentration organic analytical service is recommended.

## METHODS AND INSTRUMENTATION

For semivolatile and pesticide/Aroclor samples, a 1-L water sample is extracted with methylene chloride. For low level semivolatile soil and pesticide/Aroclor soil samples, a 30-g soil sample is extracted with methylene chloride/acetone. For medium level semivolatile soil samples, a 1-g soil sample is extracted with methylene chloride/acetone. For both water and soil samples, the extract is concentrated, subjected to fraction-specific cleanup procedures, and analyzed by GC/MS for semivolatiles or GC/EC for pesticides/Aroclors.

For volatile water samples, 5 mL of water is added to a purge and trap device and purged with an inert gas at room temperature. For volatile low level soil samples, a 5-g aliquot of soil is added to a purge and trap device with 5 mL of reagent water and purged with an inert gas at 40°C. For volatile medium level soil samples, 4 g are extracted with methanol and an aliquot is added to

a purge and trap device. For both water and soil samples, the volatiles purged from the sample are trapped on a solid sorbent. They are subsequently desorbed by rapidly heating the sorbent and then introduced into a GC/MS system. **Table 2** summarizes the instruments and methods used in this analytical service.

## DATA DELIVERABLES

Data deliverables for this service include hardcopy data reporting forms and supporting raw data. In addition to the hardcopy deliverable, contract laboratories must submit the same data on diskette. The diskette data are used by EPA to rapidly assess the contractual and technical performance of the laboratory.

The laboratory must submit data to EPA within 35 days (or 14 days for 14-day contracts) of sample receipt. EPA then checks the data for compliance with contract requirements within 10 days and adds the data to a comprehensive database of CLP analytical results. A report of instances of noncompliance is distributed to the laboratory and the Region. The laboratory has 10 days to reconcile defective data and resubmit the data to EPA. EPA then screens the data within 10 days and sends a final report to the laboratory and the Region.

## QUALITY ASSURANCE

The quality assurance (QA) process consists of management review and oversight at the planning, implementation, and completion stages of the environmental data collection activity. This process ensures that the data provided are of the quality required.

**Table 2. Instruments and Methods**

Fraction	Instrument	Method
Volatiles	GC/MS with purge and trap device	Purge and trap concentration followed by GC/MS analysis
Semivolatiles	GC/MS	Liquid-liquid extraction followed by capillary GC/MS analysis
Pesticides/Aroclors	GC/EC with dual column	Liquid-liquid extraction followed by capillary GC/EC analysis

During the implementation of the data collection effort, QA activities ensure that the quality control (QC) system is functioning effectively, and that the deficiencies uncovered by the QC system are corrected. After environmental data are collected, QA activities focus on assessing the quality of data to determine its suitability to support enforcement or remedial decisions. Each contract laboratory prepares a quality assurance plan (QAP) with the objective of providing sound analytical chemical measurements. The QAP must specify the policies, organization, objectives, and functional guidelines, as well as the QA and QC activities designed to achieve the data quality requirements for this analytical service.

### QUALITY CONTROL

The analytical data acquired from QC procedures are used to estimate and evaluate the analytical results and to determine the necessity for or the effect of corrective action procedures. The QC process includes those activities required during analytical data collection to

produce the desired data quality and to document the quality of the collected data. The QC operations required for this analytical service are shown in **Table 3**.

### PERFORMANCE MONITORING ACTIVITIES

Laboratory performance monitoring activities are provided primarily by AOC and the Regions to ensure that contract laboratories are producing data of the appropriate quality. EPA performs on-site laboratory audits, data package audits and GC/MS tape audits, and evaluates laboratory performance through the use of blind performance evaluation samples.

For more information on this analytical service, contact:

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**Table 3. Frequency of QC Operations**

QC Operation	Frequency
Surrogates (for semivolatiles and pesticides)	Added to each sample, standard, and blank
System monitoring compounds (volatiles)	Added to each sample, standard, and blank
Method blanks (volatiles)	Prepared each 20 samples for each matrix and level
Method blanks (semivolatiles and pesticides)	Prepared with each group of samples of same matrix and level, each time samples are extracted
Storage blanks (volatiles)	Prepared and stored with each group of samples received from the field
GC/MS mass calibration and ion abundance patterns (volatiles and semivolatiles)	Every 12 hours, for each instrument used for analysis

QC Operation	Frequency
GC resolution check (pesticides)	Prior to initial calibration, on each instrument used for analysis
Initial calibration	Upon initial set up of each instrument, and each time continuing calibration fails to meet the acceptance criteria
Continuing calibration	Every 12 hours, for each instrument used for analysis
Stability of internal standard responses (volatiles and semivolatiles)	Every analysis
Retention time stability	Every analysis
Matrix spike and matrix spike duplicate	Once every 20 or fewer samples of same fraction, matrix, and level

